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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

NGUYEN, LAM S

ART UNIT

PAPER NUMBER

2853

DATE MAILED: 03/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/921,683

Applicant(s)

CHANG, JUNHUA

Examiner

LAM S NGUYEN

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/23/2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 8-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 8-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 July 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

Claim 22 is objected to because of the following informalities: The “...” in “at least one of a contracted amount...of the pressure chamber” is informal. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-6, 8-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (EP 0947325 A1) in view of Chang et al. (EP 0988974 A2).

Chang et al. (EP 0947325 A1) disclose a liquid jetting apparatus, comprising:

a liquid jetting head, including a nozzle orifice (FIG. 3, element 13), a pressure chamber (FIG. 3, element 2) communicated with the nozzle orifice, and a pressure generating element (FIG. 3, element 5) which varies the volume of the pressure chamber; and

a drive signal generator (FIG. 1, element 109), which generates a drive signal including a drive pulse supplied to the pressure generating element, the drive pulse including:

a first expanding element (FIG. 9, element b);

a first contracting element (FIG. 9, element d1);

a second expanding element (FIG. 9, element f) which drives the pressure

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generating element so as to expand the pressure chamber contracted by the first contracting element, so that a marginal portion of the swelled center portion of the meniscus is pulled toward the pressure chamber (column 15, line 48-55),

wherein the drive pulse includes a contracted state holding element, which connects the first contracting element and the second expanding element such that a termination end of the first contracting element and a start end of the second expanding element have an identical potential (FIG. 4b, element e and FIG. 9, element e); and

wherein the contracted state holding element is supplied for a time period which not greater than one quarter the natural vibration period of the pressure chamber (column 13, line 50-55: Even though, this hold time t_2 is set to be $T_c/2$, it is suggested to be approximately zero (line 55) in order to stably eject a small ink drop. As an evidence, Araki (US. 6312077) illustrates this zero approximation in FIG. 5 wherein the hold time period which connects the first contracting element (FIG. 5, period T3) and the second expanding element (FIG. 5, period T4) is zero and FIGs. 6c-d illustrate that without this hold time period, a fine droplet is ejected. Thus, this example shows that the time period which not greater than one quarter the natural vibration period of the pressure chamber).

Referring to claim 2: wherein a potential difference of the first expanding element (FIG. 9, element b) wherein the potential difference of the drive signal (FIG.9, element VH).

Referring to claim 4: wherein the potential difference of the second expanding element (FIG. 9, element f: VM1-VM3) is not greater than the potential difference of the first contracting element (FIG. 9, element d1: VM1)

Referring to claim 5: wherein the second expanding element (FIG. 4b, element f) is supplied for a time period which is not greater than one quarter the natural vibration period of the pressure chamber (column 13, lin3 45-48).

Referring to claim 6: wherein a gradient of the second expanding element (FIG. 4b, element f) is greater than a gradient of the first contracting element (FIG. 4b, element d).

Referring to claim 8: wherein the drive pulse includes a second contracting element (FIG. 9, element h), which drives the pressure generating element so as to contract the pressure chamber expanded by the second expanding element.

Referring to claims 10, 19, and 24: wherein the second contracting element (FIG. 9, element t3) is supplied for a time period which is not greater than one third of the natural vibration period of the pressure chamber (column 16, line 20-22).

Referring to claims 11, 20, and 25: wherein a time period from a start end of the first contracting element to a start end of the second contracting element is not greater than the natural vibration period of the pressure chamber (column 16, line 24-29).

Referring to claims 12, 21, and 26: wherein the time period between the start ends of the first contracting element and the second contracting element falls within a range of one quarter to one third of the natural vibration period of the pressure chamber (column 16, line 24-29).

Referring to claim 13: wherein the drive pulse includes a damping hold element (FIG. 9, element i), which holds a termination end potential of the second contracting element for a predetermined time period and a damping element (FIG. 9, element j), supplied after the

damping holding element to drive the pressure generating element so as to expand the pressure chamber to a reference volume thereof.

Referring to claim 14: wherein the damping element (FIG. 9, element j) is supplied for a time period (FIG. 9, element T4) which is not greater than a half the natural vibration period of the pressure chamber (column 34-36).

Referring to claim 15: wherein a time period from a start end of the first contracting element (FIG. 9, element d1) to a start end of the damping element (FIG. 9, element j) is not greater than the natural vibration period of the pressure chamber (column 16, line 37-40).

Referring to claim 16: wherein the drive pulse includes a preliminary contracting element (FIG. 24, element b1), which drives the pressure generating element so as to contract the pressure chamber from a reference volume thereof, before the first expanding element is supplied.

Referring to claim 17: wherein the contracted amount of the pressure chamber in the second contracting element is larger than one of the contracted amount of the pressure chamber in the first contracting element and an expanded amount of the pressure chamber in the second expanding element (FIG. 13: the second contracting element h3 ($VH-VM3 = 20V$) is larger than one of the first contracting element d3 ($VM2 = 10V$) and the second expanding element f2 ($VM2-VM3 = 5V$), column 16, line 6-8), and wherein the contracted amount of the chamber in the second contracting step (FIG. 9, element h: the contracted amount $VM1 - VM3$) is not larger than an expanded amount of the pressure chamber in the first expanding step (FIG. 9, element b: the expanded amount is $VH-VL = 30V$).

Referring to claim 22: wherein a contracted amount of the pressure chamber established by the second contracting element (FIG. 13, element h3 and column 16, line 6-7: the contracted amount is $VH-VM3$ either 20V or 25V) is larger than one of a contracted amount of the pressure chamber established by the first contracting element (FIG. 13, element d3 and column 15, line 16: the contracted amount is $VM2-VL = 15V$) and an expanded amount of the pressure chamber established by the second expanding element (FIG. 13, element f2: the expanded amount is $VM2-VM3$ either 10V or 5V).

Referring to claim 23: wherein the first expanding element is supplied for a time period which is not greater than one third of a natural vibration period of the pressure chamber (column 5, line 24-25).

Chang et al. (EP 0947325 A1) do not disclose the first expanding element which drives the pressure generating element so as to expand the pressure chamber, so that a meniscus of liquid in the nozzle orifice is pulled toward the pressure chamber, the first expanding element being supplied for a time period which is not greater than a half a natural vibration period of the pressure chamber (**Referring to claim 18**); a first contracting element which drives the pressure generating element so as to contract the pressure chamber expanded by the first expanding element, so that a center portion of the meniscus is swelled in an ejecting direction of a liquid drop, a potential difference of the first contracting element being not greater than 60% or 50 % of a potential difference between a minimum potential and a maximum potential of the drive signal (**Referring to claim 3**), wherein a potential difference of the second expanding element is not less than 40% of the potential difference of the drive signal, and wherein a potential difference of

the second contracting element is not less than 75% of the potential difference of the drive signal **(Referring to claim 9)**.

However, Chang et al. (EP 0988974 A2) disclose the first expanding element (in term of "a preparatory process) (FIG. 10, element b5) which drives the pressure generating element so as to expand the pressure chamber, so that a meniscus of liquid in the nozzle orifice is pulled toward the pressure chamber (FIG. 5a), the first expanding element being supplied for a time period which is not greater than a half a natural vibration period of the pressure chamber (column 4, line 7-12); a first contracting element (FIG. 10, element d) which drives the pressure generating element so as to contract the pressure chamber expanded by the first expanding element (FIG. 5b), so that a center portion of the meniscus is swelled in an ejecting direction of a liquid drop, a potential difference of the first contracting element being not greater than 60% or 50 % of a potential difference between a minimum potential and a maximum potential of the drive signal (column 4, line 11-15), and wherein a potential difference of the second expanding element (FIG. 9, element h4) is not less than 40% of the potential difference of the drive signal (FIG. 9: element h4 has the potential $VM4 = 10V$ which is greater than 40% of the potential $VM2 = 15V$) **(Referring to claim 3)**, and wherein a potential difference of the second contracting element is not less than 75% of the potential difference of the drive signal (FIG. 10, element j5) **(Referring to claim 9)**.

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to set the time period of the first expanding element not greater than a half a natural vibration period of the pressure chamber, the potential difference of the first contracting element not greater than 60% or 50 % of a potential difference between a minimum

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potential and a maximum potential of the drive signal, the potential difference of the second expanding element not less than 40% of the potential difference of the drive signal, and the potential difference of the second contracting element not less than 75% of the potential difference of the drive signal in the waveform of Chang (EP 0947325 A1) as taught by Chang (EP0988974 A2). The reason of doing so is that the quantity of ink composing an ink droplet can be reduced as much as possible without deteriorating the flying speed of the ink droplet in order to increase the printing quality as taught by Chang (EP 0988974 A2) (Abstract).

Response to Arguments

Applicant's arguments filed 12/23/2002 have been fully considered but they are not persuasive.

Regarding to the argument on page 7 referring to claim 1: The applicant argued that the Chang references fail to disclose wherein the contracted state holding element is supplied for a time period which not greater than one quarter the natural vibration period of the pressure chamber. However, as discussed above, the Chang (EP 0947325 A1) reference discloses this limitation. Therefore, the claimed invention is unpatentable.

Regarding to the argument on page 8 referring to claim 17: The applicant argued that the Chang references fail to disclose wherein the contracted amount of the chamber in the second contracting step is not larger than an expanded amount of the pressure chamber in the first expanding step. However, as discussed above, the Chang (EP 0947325 A1) reference discloses this limitation. Therefore, the claimed invention is unpatentable.

Regarding to the argument on page 10 referring to claims 2-6, 8-16, 18-21, and 23-26: The applicant argued that the since claims 1, 17, and 22 are patentable, claims 2-6, 8-16,

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18-21, and 23-26 are patentable. However, claims 1, 17, and 22 are unpatentable and claims 2-6, 8-16, 18-21, and 23-26 are rejected as discussed above. Therefore, claims 2-6, 8-16, 18-21, and 23-26 are also unpatentable.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (703)305-3342. The examiner can normally be reached on 7:00AM - 3:30PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOHN E BARLOW can be reached on (703)308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are (703)305-3431 for regular communications and (703)305-3432 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

LN

February 28, 2003


John Barlow
Supervisory Patent Examiner
Technology Center 2800